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WRITTEN REPLY

To Mr. Masaaki Moriuchi, Examiner at the Patent Office

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1. Display of International Application

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5. Content of Reply

(1) Regarding the present application, we have received the written opinion of the International Searching Authority holding that Claims 1 to 12, 15 to 20, and 23 to 28 lack novelty and Claims 1 to 20 and 23 to 28 lack inventive step, and we reply as follows.

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(2) Description of the Invention of the Present Application

The configuration of the projection lens according to the invention of the present application (Claim 1) is as follows. In order to clarify the difference from the cited documents 1 to 5, Claim 1 was amended (see
5 underlined portions (c) and (e)).

(a) A projection lens for magnifying and projecting an optical image formed on a spatial light modulator onto a screen, comprising:

(b) a front lens group and a rear lens group that are arranged in this order from the screen side toward an image plane side,

10 (c) wherein an optical path bending means is provided between the front lens group and the rear lens group.

(d) the rear lens group has an aperture stop that is eccentric with respect to an optical axis common to the front lens group and the rear lens group,

15 (e) the aperture stop is eccentrically displaced within a plane containing the optical axes upstream and downstream of the optical path bending means and in a direction toward the front lens group, and

(f) focus adjustment is performed by moving the rear lens group in a direction of the optical axis without rotating the rear lens group.

20 The constituent feature (c) added was described in claim 4 as originally filed, and the constituent feature (e) added is based on the description on page 37 lines 15 to 17¹ of the specification of the present application and in FIGS. 16 and 20, for example.

25 It is an object of the invention of the present application to provide a projection lens that, though designed for right projection, shows good aberration performance and can realize specifications required for a projection display apparatus, such as a low F number, a wide angle, a long back focus,

¹ Translators note. These correspond to page 43 lines 27 to 30 of the English translation.

and a high relative illumination, with a rational configuration. In order to attain this object, the invention of the present application especially adopts a configuration in which “the aperture stop in the rear lens group is eccentrically displaced within a plane containing the optical axes upstream and downstream of the optical path bending means and in a direction toward the front lens group,” thereby reducing an optical path bending space and realizing a compact projection lens that can be rationalized and can achieve higher performance.

That is to say, according to the invention of the present application, it is possible to achieve the effects that are specific to the invention of the present application, such as “a reduction of the optical path bending space” due to the relationship between the direction of eccentricity of the aperture stop and the optical path bending means and hence “miniaturization, rationalization, and performance enhancement of the projection lens.”

(3) Comparison between the Invention of the Present Application and the Inventions described in the Cited Documents

(α) Cited Document 1 (JP 2003-255226A)

It is an object of the invention described in the cited document 1 to provide a projection lens in which the size of a rear lens can be reduced and that projects an image with small unevenness in illuminance. In the cited document 1, the projection lens is constituted by a first lens group, a second lens group, an aperture stop that is eccentrically displaced from an optical axis in a vertical direction, a third lens group, a fourth lens group, and a plane parallel glass that are arranged in this order.

(β) Cited Document 2 (JP 2003-202492A)

It is an object of the invention described in the cited document 2 to provide a wide-angle projection lens that can ensure a sufficiently large back focus ratio, has a high resolution, and realizes a small F number. In the cited document 2, the projection lens is constituted by a first lens group, a second lens group, an aperture stop that is eccentric with respect to an optical axis,

and a third lens group that are arranged in this order.

(γ) Cited Document 3 (JP 2001-42211A)

It is an object of the invention described in the cited document 3 to provide a projection lens capable of projecting an original image to be projected displayed on a liquid crystal display device onto the surface of a screen with high optical performance. In the cited document 3, the projection lens is constituted by a first lens group, an aperture stop, an optical path bending means, and a second lens group that are arranged in this order.

(δ) Cited Document 4 (JP 2003-202493A)

It is an object of the invention described in the cited document 4 to provide a projection lens that corrects variations in aberrations during focusing satisfactorily over the entire object distance range from an object located at infinity to an object located at short distance, and provides high optical performance. In the cited document 4, the projection lens is constituted by a first lens group, an aperture stop, and a second lens group that are arranged in this order.

(ε) Cited Document 5 (JP 2003-156683A)

It is an object of the invention described in the cited document 5 to provide a projection lens having a long back focus and a telecentric property and inside of which an optical path is converted. In the cited document 5, the projection lens is constituted by a first A lens group, an optical path bending means, a first B lens group, an aperture stop, and a second lens group that are arranged in this order.

(ζ) However, none of the cited documents 1 to 5 at all discloses “a configuration in which an optical path bending means is provided inside a projection lens and an eccentric aperture stop is provided in a lens group that is located either upstream or downstream of the optical path bending means” as that of the invention of the present application and do not even contain a description suggesting this configuration. Accordingly, it goes without saying that the cited documents 1 to 5 neither describe nor suggest the relationship

between the direction of eccentricity of the aperture stop and the optical path bending means.

Therefore, according to the inventions described in the cited documents 1 to 5, the aforementioned effects that are specific to the invention of the present application, such as “a reduction of the optical path bending space” due to the relationship between the direction of eccentricity of the aperture stop and the optical path bending means and hence “miniaturization, rationalization, and performance enhancement of the projection lens,” cannot be achieved.

10 (4) Conclusion

As described above, all of the cited documents 1 to 5 neither describe nor suggest the effects that can be obtained by “a configuration in which an optical path bending means is provided inside a projection lens and an eccentric aperture stop is provided in a lens group that is located either upstream or downstream of the optical path bending means” and by possessing that configuration and that are specific to the invention of the present specification.

Therefore, not to mention that the invention of the present application has novelty, it is believed that the invention of the present application even has inventive step because no matter how a person skilled in the art combines the cited documents 1 to 5 mentioned above, it is difficult for the person skilled in the art to conceive the invention of the present application.

Although the cited documents 1 and 2 disclose an eccentric aperture stop, these cited documents do not disclose a configuration in which the eccentric aperture stop is provided in a predetermined lens group of a projection lens. Moreover, although the cited documents 3 and 5 disclose an optical path bending means, these cited documents do not disclose a configuration in which an aperture stop is provided in a lens group that is located either in front or at the rear of the optical path bending means. Therefore, even if the cited document 1 or 2 and the cited document 3 or 5 are

simply combined, the invention of the present application cannot be conceived, and also the aforementioned effects that are specific to the invention of the present application cannot be achieved.